



New Mission Need or Requirement Request

16-005 A Nationally Consistent, Science-based Approach to Identify Potentially Dangerous Heat Events

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CONTACT INFORMATION

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1 Statement of Mission Need or Requirement

1.1 Mission Need or Requirement

Requirement: A nationally consistent, science-based approach to identify potentially dangerous heat conditions to all those we serve.

To build a Weather Ready Nation (WRN), we need to ensure that all communities have the right information at the right time to make the right decisions. Alerting the public to possible weather threats is core to the National Weather Service (NWS) mission. Public, commercial, and government users all desire and expect information on heat that will help them make decisions to protect lives and property. While the NWS does provide detailed heat products, these products are typically issued only a day or two out from expected heat. Since they are criteria-based, they are generally issued only a few times a year when heat is exceptional. The approach and criteria used for issuing these heat products typically varies from Weather Forecast Office (WFO) to WFO. These criteria and approaches typically do not resolve the localized nature of heat impacts that drive local responses and allow local communities to be part of a WRN when it comes to heat. Continuing to pursue criteria-based thresholds will likely lead to even more inconsistencies between offices. As we gather more and more impact data, we realize that various groups have different action thresholds that they use when making their decisions. Gathering impact data related to heat can be challenging due to restrictive privacy regulations and inconsistent reporting, along with complicated human factors associated with how heat affects the individual. Impact information is much more powerful when used to formulate appropriate messaging and historical risk probabilities than when used to simply generate a new criteria threshold. There is a need for the NWS to develop a methodology that will result in a nationally consistent heat risk system that would:

- a. Put heat into a climatological framework which identifies periods of unusual heat for a particular location which would potentially lead to negative impacts, such as heat stress;
- b. Provide a full suite of heat risk information from the current date through Day 7 (preferably at National Digital Forecast Database (NDFD) resolution) with no additional forecaster workload in a nationally and scientifically consistent manner; and
- c. Incorporate a decision maker's impact information within a local climatology of Heat Impact Levels (HI) to generate historical risk probability information that can then allow a partner to make more effective decisions and take appropriate actions for future heat events.

By using the same methodology across the country, a consistent heat risk system can be developed which not only can be used to base decisions on for upcoming heat events, but by linking historical impacts to climatology for a location, can be used to provide historical risk probability information to both the user and the NWS to allow for more effective messaging and actions.

1.2 Time Sensitivity

We would like to have such a service available as soon as possible in order to best assess its value in heat-related decision making during the upcoming heat season.

1.3 Existing Operational Gaps

Methodologies for issuing heat watch, warnings and advisories vary significantly across WFOs. This inconsistency results in a patchwork of heat products, sometimes within the same state, causing confusion and frustration from decision makers charged with response efforts. A framework that provides a consistent science-based approach to place forecasted heat into a high resolution climatological-based context will address this inconsistency..

2 Justification and Benefits to the NWS

2.1 Strategic Drivers and Mandates

Does the requirement address a mandate by NOAA, DOC, OMB, Executive Order, or Law?	Y
Is the requirement needed to satisfy a specific external organization's needs?	Y
Does the requirement address a specific DOC, NOAA, or NWS strategic initiative?	Y
Explanation of justification: Current State and local heat plans in the state of California are written with actions directly tied to NWS Excessive Heat Warnings. The current NWS Excessive Heat Warning criteria are an adopted national Heat Index standard and are rarely reached in CA. Through the years, several offices in CA have developed their own approach and criteria after working with local partners, including the introduction of Heat Advisories. This has resulted in confusion and border issues for the State, local EM's, the media, and the general public. As a result, the Heat Impacts Level (HIL) project was developed in the spring of 2014. The goal of the project was to design a better tool for NWS offices and partners to utilize, understand, and be easily shared, so that all could be alerted to, prepare for, and mitigate as much as possible, future heat events. After two heat seasons of assessment, the State of California Office of Emergency Services and other partners introduced to the HIL view the approach positively and would like the project to become official. They would like to tie the HIL to their State and local heat plans, but cannot do so until the HIL become part of office policy. We have received other positive comments from other heat health partners on the approach and additional information included with the HIL service. We have also received positive feedback from the Centers for Disease Control and are engaging them to better understand how their work on heat health exposure relationships can be used to inform impact levels in the HIL. NOAA has a long term goal that Society is prepared for and responds to weather-related events. This is the central point of the NWS Weather-Ready Nation initiative. Within this NOAA Strategic Goal are objectives to 1) reduce loss of life, property, and disruption from high-impact events, 2) improve transportation efficiency	

and safety, 3) develop a suite of integrated, nationwide health-based weather services to support healthy people and communities due to improved air and water quality services, and 4) a more productive and efficient economy through environmental information relevant to key sectors of the U.S. economy. A consistent methodology for issuing heat products has the potential to positively impact each of those objectives. The HIL advances available heat information beyond the current product suite, and produces additional information that can be used by partners and customers to make more informed decisions.

The NWS WRN Roadmap specifically states the NWS will need to improve services by: 1) a shift from product-focused service to interpretation and consultation, 2) improving the usefulness of products and services for decision making, 3) delivering information in a way that conveys its potential impact to support good decision-making and planning and 4) seamlessly linking climate and weather through IDSS. The HIL approach serves as a framework that could do all these things, not only for heat, but for other weather phenomenon as well. The HIL will be used in an upcoming Hazard Simplification heat episode to further explore the feasibility of using its methodology to convey impacts and support IDSS.

2.2 Benefits

Describe how the request will benefit NWS' mission to protect life and property.

Describe how the request will help the NWS better serve our partners and the public.

Describe how the request will improve how NWS operates.

Describe how the request will help NWS be a better steward of government resources (e.g., time or money).

Explanation of benefits to NWS:

As explained previously, the HIL benefits the NWS' mission to protect life and property by providing additional and consistent information about upcoming heat risk that can be used by a myriad of users with different action thresholds without increased forecaster workload. It allows the NWS to not only provide information in advance of heat, but when tied to historical impact information provided by our partners, can generate historical risk profiles (i.e. when the HIL has been red in July for this location, hospital admittance from heat-related causes went up by 72%). This information can allow our users to make better heat-related decisions and take better informed actions, and allow the NWS to more effectively message true impacts from upcoming heat. Since the HIL data can be generated within AWIPS/GFE without any additional workload on the part of the forecaster, it would allow the NWS to be a better steward of government resources by providing a daily service with no additional time or money after installation. The proposed HIL is another NWS tool that could be used to protect lives and property from the potential risk of excessive heat, and is especially useful for those who are more affected by heat and those decision makers who provide support to those communities.

3 National Service Program

Program Name	X	Program Name	X	Program Name	X
Aviation		Tropical		Public	X
Fire Weather		Winter Weather		Space Weather	
Marine		Climate	X	Tsunami	
Severe Weather		Water Resources		Overarching	

4 Estimated Resource Needs

To meet the needs of core partners in the state of California, the Heat Impacts Level (HIL) project was developed in the spring of 2014 (see appendix A). The goal of the project was to design a better tool for NWS offices and partners to utilize, understand, and share, so that all could be alerted to, prepare for, and mitigate (as much as possible) future heat events. If the requirement is validated, the prototype HIL can be made available for consideration as a potential national solution. The HIL can be generated internally in the Graphical Forecast Editor (GFE) on an office's Advanced Weather Interactive Processing System (AWIPS) from official temperature grids and offices will be able to create specific images for use in social media and Impact Based Decision Support Services (IDSS) using a graphics generating program available on the AWIPS Developer Collaboration Portal (SCP). For testing the HIL on a national level, Western Region (WR) Headquarters can provide an installation script and appropriate climate files through a Mod Note. It is expected that installation should take 2-3 hours, with the majority of time occupied with processing necessary grids to support the HIL. Since it runs on available machines and no forecaster intervention is required, no additional resource needs are anticipated at the forecast office level. On the outreach side, there would be some human resource needs to present the HIL information to external partners, explain how it could be used, work with their impact data to create historical risk profiles, and otherwise help to interpret and consult with heat-affected decision makers. Externally, the HIL can be made available on a webpage in the form of (1) an ESRI layer that supports zoom functionality, sampling, and download capability and (2) static images. Each participating office would have a direct link to this page which is automatically zoomed into their forecast area perspective. WRH would host the webpage on local servers already in place for other projects. No significant additional resource needs are anticipated at the regional office level, aside from random support needs if hardware fails or scripts stall, and some initial coding to create the HIL data layer.

APPENDIX A

Heat Index Level (HIL) Project

This framework is a simple numeric (0-4) color-based (green/yellow/ orange/red/magenta) system which, when provided as an actual gridded product, allows decision makers to make the heat related decisions they need to make at the thresholds they determine. Consistent, but generalized, heat-related science-based rules are utilized to generate daily numeric/color threshold values for each grid box in the forecast database utilizing high-resolution local climatology. This produces unique heat curve thresholds which vary throughout the year and from grid box to grid box. These values are then compared to the NDFD MinT and MaxT forecasts to automatically generate the appropriate number/color for the expected level of heat impact, without additional forecaster workload. With a climatology of HIL values for a particular location, collected impacts from a partner can then be placed into a historical risk probability framework, allowing the partner to benefit from understanding their particular risk/thresholds (e.g. at red levels in June, morbidity statistics at a location went up by 72%) and the NWS to better message true impacts from heat (e.g. on a day like today, this population is 72% more at risk of heat-related morbidity). This climatological-based service framework allows the local office to tailor risk information to the unique climatology and user needs of their CWA, but also provides a consistent risk service across CWA boundaries with differing climatologies and varied user needs.

The experimental HIL forecast is available for any location from the current date through seven days in the future. The HIL places forecasted heat for a specific location into an appropriate level of heat concern for that location, along with information identifying who/what is primarily at risk at that level. The HIL is accompanied by recommendations for heat protection and is expected to be a useful tool for planning for upcoming heat. It is not the same as the Heat Index or specifically linked to the NWS heat watches, advisories, or warnings. These products remain the official products from the NWS. Instead, the HIL represents a new experimental approach to providing daily heat risk information in an easy to view format and a nationally consistent methodology.

The HIL web page was developed to provide a single web portal from which our users can obtain this risk information on upcoming heat episodes. The web portal will provide information to users before a heat event for planning and preparedness purposes. An overview of the HIL is provided, along with a seven day interactive map of the HIL, along with identifying which groups are most at risk. The user can also click on their location (or enter their zip code) and drill down for more specific information in their area, along with accessing the official NWS temperature forecast for that location (and any relevant heat products in effect).

The experimental HIL is another NWS tool that can be used to protect lives and property from the potential risk of excessive heat, and is designed to be especially useful for those who are more affected by heat and those decision makers who provide support to those communities.

Feedback from Core Partners:

The Heat Impact Level graphics are very nice. It's easy for me to share with our manager's and to allow them to understand the geographic limits of the heat events. The information was used in the decision making to do a heat press release from our Director and our Public Information Office. I use the information to graphically illustrate to our 200+ field inspectors where the hazards of heat are likely to exist during the event to prepare them, and also to direct enforcement staff into the areas of highest impact so that they can conduct inspections on outdoor workplaces to establish compliance with California's Heat Illness Prevention Standard, Title 8 CCR 3395. [CA OES in an OPM-approved HIL survey]

Good morning, in an analysis of the potential heat risks for next week it appears that we should be prepared to move to Phase II of the Heat Contingency Plan on beginning June 20 through June 21. A graphical description of the heat impact levels is below for June 21. You will see that there is a large portion of southeastern CA colored in magenta which is defined as Very High Risk for the entire population due to long duration heat, with little or no relief overnight. I will be contacting NWS for further analysis and to set-up a briefing to key stakeholders per the Heat Contingency Plan. I am also cc'ng some primary stakeholders in this e-mail as a heads-up. [Message from CA State Warning Center in advance of a potential historic June 2016 heat wave]